WORK SIMPLIFICATION — MANAGEMENT'S TOOL FOR ECONOMY

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PREFACE

The maintenance of aircraft has been of considerable interest to me since the time I entered the United States Marine Corps, and increasingly so from the time I was designated a Naval Aviator in 1956. I worked as Aircraft Maintenance Officer and Assistant Aircraft Maintenance Officer of Marine Fighter Squadron 235 during 1957 and 1958. Upon being transferred to the First Marine Aircraft Wing, Iwakuni, Japan, in December of 1958, I worked as Flight Test Officer, Line Maintenance Officer, and Assistant Aircraft Maintenance Officer of Marine Aircraft and Repair Squadron 17 until March, 1960. I was transferred to Marine Training Squadron 2 in April, 1960, and was again assigned to the aircraft maintenance billet. I was often perplexed at the different special tools and the quantity of them needed to perform routine maintenance of aircraft for normal operations. Each type of aircraft appeared to have its own special tools designed for a specific job, and the particular tools required for one type of aircraft would not work satisfactorily on a different type.

During these few years I often talked to the aircraft technical representatives and asked them why they did not make a single set of tools to fit all aircraft, thereby eliminating

the duplication of tools and effecting savings to the government of millions of dollars each year.

Further analysis of the problem led the writer to believe that if this could be accomplished, the personnel working on aircraft could then work much faster and with more safety, save valuable man-hours, and also make the aircraft much safer to fly.

The writer, having been born on a farm in Indiana and having farmed during the early years of his life, was always looking for the easiest method of accomplishing a job, unconsciously realizing that often it was work simplification that accomplished many of the farm chores. I have always felt that prior planning prevents poor performance. Carrying this philosopy into college where I participated extensively in athletics, it was evident that many times a concept of work simplication was the margin between winning or losing an athletic event.

Upon entering the military service I was assigned the responsibility of helping to maintain aircraft for pilot efficiency and combat readiness. It was evident that this job could be accomplished only through effective leadership and an analysis of the personnel. The ultimate result of my efforts was the award for the "Best Marine Fighter Squadron on the East Coast.[1]

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[1]Marine Fighter Squadron 235 won the U. S. Marine Corps Commandant's Aviation Efficiency trophy in the spring of 1958 for its outstanding performance and combat readiness. Marine Corps Order 3590.11B establishes the criteria by which the award is made each year.

Although one does not find work simplification on the organization chart of a Marine Aircraft Squadron, it is found in every organization from the file clerk to the plane captain on the flight deck of a carrier or on the flight line. The unconscious movements of the plane captains, as they move about the aircraft readying it for the next flight, can be either rewarding or exasperating. Having been a flight line officer, I know from experience that there have been many times when suggestions have been made to plane captains to help make their jobs simpler and easier. If these suggestions had been followed, it would have created better availability of aircraft and more productive man-hours.

Even though there never has been an all-out program called "work simplification" in the Marine Aviation structure, many time-saving suggestions and operations have appeared which have passed from one group to another. These time-saving efforts have usually been generated because someone tired of "making" work for himself and decided that there had to be an easier method of accomplishing the job. What was the ultimate outcome of his analysis? It was work simplification, or, to the individual performing the job, an "easier" method.

Although this writer often suggested many aspects of work simplification to his subordinates, he did not call them by this name. I thoroughly dislike seeing people "make" work for themselves.

I chose this topic hoping that more people will analyze themselves and their jobs in order to arrive at a solution or present suggestions which will ultimately benefit themselves and the military services. Even though I have not been a specialist in the field of management engineering which embraces work simplification, I hope that I will henceforth prove to be a better qualified officer through its use and through the application of other management techniques.

I have endeavored to limit this paper to the history of work simplification and how it has progressed. As a model I have used the Overhaul and Repair Department, Marine Corps Air Station, Cherry Point, North Carolina, and what knowledge and experience I have had as a maintenance officer of a tactical jet fighter squadron. It should be understood that the writer is a neophyte in management engineering. He is, however, endeavoring to present additional information on the subject of work simplification whereby everyone can have more time to enjoy the finer aspects of life.

I wish to thank personnel of the Bureau of Supplies and Accounts Library for their assistance in obtaining the material for this thesis. Acknowledgment is given to the Management Engineering Office of the Marine Corps and its assistance in getting this paper initiated. Thanks is given to Mr. Carl W. Clewlow, Professor of Management Engineering, George Washington University, for his direction and guidance on this paper.

Acknowledgment is given to Lieutenant Colonel John L. Herndon, United States Marine Corps, for his guidance in the early stages of my development into a maintenance officer. Through his guidance and leadership I have a sincere love for the complicated, complex pieces of machinery which we fly today.

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CHAPTER I

INTRODUCTION

Purpose

The purpose of this paper is to review in general terms the principles and techniques of work simplification and to discuss in detail what can be accomplished through the correct utilization of men, money, and resources when applied work simplification is utilized throughout the government and specifically in the Marine Corps.

The writer is interested basically in discussing the various aspects of work simplification and how they are applied through correlation with work measurement. It must be understood that work simplification cannot exist without an analysis of a particular job or operation and a correlation drawn.

An attempt will be made to divorce the subject of work simplification from the commonly used term called "standards." Standards are hard to define, to set, and sometimes to meet. So-called standards in one situation may appear completely unreasonable in another. Also, the question arises as to who sets the standards and by what measuring tool they are set. There are so many variables when discussing standards that divorcing work simplification from standards creates a safer

viewpoint on the part of this writer. One may be sure that there are many who would take immediate exception to the above statement, but the "stage" has been set and justification follows.

Measurable Profits

How does one measure the profits of the Marine Corps or any of the armed services?

Every year, as the national defense budget appropriations are approved by Congress and funds are apportioned, they are essentially expended the first of each and every quarter. Through these obligations and expenditures, we must arrive at high combat readiness and efficiency. How do we attain this combat readiness and efficiency? Some is attained through "brawn" and some through "brain." Why can we not have both brain and brawn to arrive at an ultimate goal? We can through the use of work simplification, and thereby we will be able to meet our objectives through the proper use of men, money, and resources.

It is evident that if we are to meet our defense needs, within the limits of the available resources, we must use every man-hour, every gallon of gasoline, and every vehicle with the same importance placed upon each as if it were the only one available. We have to get the most for our money.

The United States now maintains a peacetime armed force at the highest level and the highest readiness in its history. Even with this there exists at present a move to have better

manpower utilization.[1]

Because of the budgetary ceilings in peacetime and the limitations on the number of personnel available, more must be accomplished with fewer personnel. Because of the limitations in manpower resources, we must keep our productive ratio of manpower to output at an all time high.

Who Is Responsible for the Effective Use of Manpower

Commanding officers are reminded of the United States Navy Regulation which states: "It is the commanding officer's responsibility to exert every effort to maintain his command in a state of maximum effectiveness."[2] This requires that a constant evaluation be made of all command functions in an effort to eliminate trouble spots and unnecessary paper work, to build morale and to encourage more efficient methods of operations.

What can be the basis for encouraging more efficient methods of operation? Work simplification is a primary tool that can be evaluated and encouraged by commanding officers. Work simplification permits continuous evaluation of command

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[1]Letter from the President to the Heads of Executive Departments, dated October 11, 1962. Cf., U.S., Bureau of the Budget, Circular No. A-44 Revised, dated October 31, 1962; and U.S., Department of the Navy, SECNAV Instruction 5310.8, dated January 9, 1963.

[2]U.S., Department of the Navy, Navy Regulations (1948 ed., Washington: Government Printing Office, 1962), Article 0704.

organizations by analyzing existing methods and procedures with a view toward improving or simplifying them. There is always a better way of performing a task; by using better working conditions, shorter procedures, or improved and easier methods.

The achievement and maintenance of effective manpower utilization is not something done to, or for, a command. Achievement of effective manpower utilization is something a command does for itself. The effectiveness of the command can be stated as directly proportional to the leadership and guidance given by the commanding officer and all elements of the command. The commanding officer must have good subordinates and noncommissioned officers who are enthusiastic to contribute to the unit and to work together in harmony for the ultimate in combat readiness, effectiveness, and efficiency.

The drive and desire for maximum effectiveness is the utmost goal of all military organizations. They must utilize scientific management and modern management techniques to attain this goal. It can be expected that those who participate in the work simplification process (this includes every person in the military) will acquire a knowledge of their organization and doctrine far superior to what they had accepted as normal. They will not only know the doctrine but they will gain an appreciation of the logic underlying it and a firm conviction that there is a "better way."

Without a systematic approach, in most cases there is no spark to generate work simplification or improvements in methods. Occasionally, command interest in a particular area

results in work simplification or methods changes. Additional requirements by a user or lack of funds also stimulate improvements. At other times, a method or operation becomes so bad it cannot be ignored. In any case, these changes are sporadic by nature rather than routine. Why?

Part of this was due to the wartime conditions and the related adjustments when costs and the number of personnel were not considered important. Both World War II and the Korean conflict slowed the emphasis on cost reduction and work simplification. But now we must get back "between the traces" and have greater cost reduction and more effective work simplification. Where is this spark generated? One cannot point a finger at top management or to the lowest levels, but the "fingers" must be pointed toward every person in the organization.

CHAPTER II

WORK SIMPLIFICATION--DEFINITION, HISTORY AND DEVELOPMENT

What Is Work Simplification

One of the frequently quoted definitions of work simplification is: "The systematic analysis of any type of work to: (1) eliminate unnecessary work; (2) arrange remaining work in the best order possible; and, (3) make certain that the right method is used."[3]

There is always a better way of doing a job: better methods, improved tools, better working conditions, shorter procedures. All can be discovered when the supervisor, commander, or director, and the workers pool their efforts to find them.

Work simplification is a planned approach with a purpose and direction. The planning, purpose, and direction are all important--they are the difference between a haphazard approach and a carefully thought-out program for profitably attacking a problem. Work simplification involves thinking in an orderly manner about the work being considered and then working out the best possible method that can be thought of at the time. It

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[3]Gerald Nadler, Work Simplification (New York: McGraw-Hill Book Company, Inc., 1957), p. 2.

involves more than just a quick look at some particular manufacturing operation with the idea of simplifying it. Everything that happens to a part--every operation, every transportation, every inspection, every storage--is studied for the possibility of eliminating the unnecessary and simplifying the rest.

Work simplification is a common sense, systematic method of identifying and analyzing work problems, developing solutions, and installing improvements. This program--drawing on the great and more often unused reservoir of practical knowledge represented by officers and senior noncommissioned officers--aids the commanding officer in insuring the maximum use of available man-power and resources. Work simplification permits continuous evaluation of command organization by analyzing existing methods by the use of improved tools, through better working conditions or procedures. However, these better methods are not always apparent. Skills in the use of selected work simplification techniques are developed through informed conferences and application in the work situation, supplemented by an active follow-up program. This organized and logical approach is designed to find easier and better ways of doing work.[4]

Work simplification is designed to produce quantitative, not qualitative measurements. Quality control, another phase of

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[4]U.S., Department of the Navy, Bureau of Naval Personnel, Personnel Analysis Division, Work Simplification for Naval Units, NAVPERS 18359, 1954.

management engineering, provides the qualitative measurements.

Results to be obtained from work simplification, as in the case of results from any system which embodies the principle of time versus performance, are valid only when the basic data are comparable, and when there has been identification of the variables that affect either factor.

When drawing on the intelligence of the human brain, the easiest method in obtaining an ultimate goal is usually the hardest. It is well recognized now that the brain not only never tires, but becomes more productive and efficient with use. Moreover, no one has as yet been able to utilize more than a small fraction of the potential of his brain.[5]

Work simplification affects all command personnel, both military and civilian. All levels of management from the commanding officer to the noncommissioned officers should be aware of, and apply, these proven techniques for simplifying work. Active participation of the officer and noncommissioned officer is essential to the success of a work simplification program.

Du Pont de Nemours and Company says: "Work simplification is simply the orderly use of plain common sense to find better ways of doing work."[6]

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[5]Lecture by James Mosel, Associate Professor of Psychology, George Washington University, Washington, D. C. presented to the Navy Graduate Financial Management Class, September 6, 1962.

[6]Definitions of companies that have been used in the lectures at the Work Simplification Conference directed by

Allen Mogensen says: "It is the organized use of common sense--on the part of everyone involved--to find easier and better ways of doing work."[7]

Standard Register Company says: "Work simplification means doing a better job with fewer steps, less effort in less time."[8]

Marshall Field and Company says: "It is just a common sense step-by-step way of studying our jobs to find better ways of doing them and make our work easier and better."[9]

Work simplification is synonymous with many connotations used in management engineering. Work measurement, time study, motion study, methods study, quality control, and others used in everyday life are synonyms of work simplification.

Basically, it is more than a definition. It is a philosophy--a way of thinking--a realization that there is a better and easier way or easier recognized as using common sense in relation to everything we do, whether at work, play, or relaxing.

Work simplification is an organized and simplified plan for the application of common sense in finding better and easier ways of doing work.

Allen H. Mogensen at Lake Placid, New York, and at Sea Island, Georgia. (U.S., Department of the Army, Rock Island Arsenal, Work Simplification Program, n.d., n.p., mimeographed.)

[7] Ibid.

[8] Ibid.

[9] Ibid.

It is a systematic approach to the elimination of unnecessary effort and detail resulting in the expenditures of time, energy, and materials. The better ways for performing work which will be found will be the "best" for the conditions under which the work is performed. Nothing says that work performed under one situation will work as effectively under a different situation.

The optimal decision rule prescribes courses of action for which the claim can be made that decisions are "The Best Possible," the meaning of "Best," being clearly specified.[10]

To produce the ultimate test for the optimal decision rule, one must decide whether the new method outperforms the old method after subtracting the cost of obtaining the optimal decisions.

In 1886, the analytic method of management was started by Henry R. Towne. Mr. Towne's paper on "The Engineer as an Economist" stated that an executive is an engineer and a person who can record and observe people."[11]

Mr. Towne was followed by Frederick W. Taylor and his Principles of Scientific Management.[12] It is worthy of note that in 1911, a Congressional investigation into the Taylor and other systems of shop management resulted in a prohibition on the use of stop watches in government service.

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[10] Edward H. Bowman and Robert B. Fetter, Analysis for Production Management (Homewood, Illinois: Richard D. Irwin, Inc., 1961), p. 170.

[11] Cited by Ibid, p. 13.

[12] (New York: Harper and Bros., 1942).

Taylor utilized the time standard in his studies. He anticipated no thought for the human body and tried to get as much out of the employee as possible. He felt that the monetary aspect would compensate for the additional hard labor and overtime. This was applied to the piecework method of manufacturing. Taylor's philosophy was not widely accepted.

Taylor said that when men work in groups or gangs their efficiency falls off. If the individual works by himself his efficiency stays high. This has proven to be incorrect in many studies.[13]

While Taylor was using his management theory, Dr. and Mrs. F. B. Gilbreth were working in another aspect--motion and time study.[14] Motion and time study is the analysis of the methods, of the material, and of the tools and equipment used, or to be used, in the performance of a piece of work--an analysis carried on with the purposes of (1) finding the most economical way of doing work; (2) standardizing the methods, materials, tools, and equipment; (3) accurately determining the time required by a qualified and properly trained person working at a normal pace to do the task; and (4) assisting in training the worker in the new method.[15]

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[13]Cf., A. Zaleznik, C. R. Christensen, and F. J. Roethlisberger, The Motivation, Productivity, and Satisfaction of Workers: A Prediction Study (Boston: Harvard Business School, Division of Research, 1958).

[14]F. B. Gilbreth, Motion Study (New York: D. Van Nostrand Company, 1911).

[15]Ralph M. Barnes, Motion and Time Study (New York: John Wiley and Sons, Inc., 1958), p. 3.

Dr. and Mrs. Gilbreth did extensive studies of construction work, and in utilizing and developing such techniques as the process chart, micromotion study, and the chronocyclegraph.

Micromotion study is the utilization of motion pictures to study the movements of individuals at work.[16]

Chronocyclegraphic study is the study of movements by placing a small, lighted bulb on the hands of the operator and using a still camera with an open shutter. This photographs the light movement through the process and can be studied and analyzed as to speed of movements (if the light bulb is flashing), and as to correct motions. This study also assists in developing new teaching methods.[17]

Once, when speaking of human fatigue, Frank Gilbreth said:

> The waste in unnecessary fatigue is not only an economic waste, it is a waste of life, and it calls for immediate attention of every one of us, whether interested in the individual, the group, or the economic prosperity of our country.[18]

Most people would agree with this statement. Man has struggled since the dawn of history to lighten the burden of his daily effort, and his progress has been steady and sure, when considered in the long run. But in any particular situation

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[16] Ibid., p. 15.

[17] Ibid., p. 16.

[18] Quoted in Robert N. Lehrer, Work Simplification, Creative Thinking About Work Problems (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1957), p. v.

his actions do not always conform to his desires, and thus the goal of work simplification often becomes difficult to attain.[19]

As the sun rises in the east to start our day, we hopefully coordinate one of the most complex machines, i.e., the human body, to achieve some of the simplest tasks and routines that surround us daily. Every person has a sequence or routine about which a physiological and psychological balance must be maintained or the amount of energy expended during the day is wasted. The person who is organized and has planned well will undoubtedly achieve more during the day than will the person who is unorganized. This is basic work simplification practiced with the human machine. But place this human machine in a surrounding of simple machines and invariably the human machine can add some complex movements to the process and expend useless energy accomplishing nothing.

Without question, one of the best advances in work simplification has been the concern for the human being.[20] The human being can apply techniques of designs and improvement in work, creating a surrounding of harmony and high morale.

Every invention is basically a tool derived from a form of work simplification. When Henry Ford built his first automobile it was a means of faster transportation. This ultimately led to accomplishing more efficiently a specific job in less time. Eli Whitney, Thomas Edison, and others, by their

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[19] Ibid.

[20] Nadler, op. cit., p. 1.

inventions, expressed the fundamental philosophy of work simplification. The number of inventions submitted each year for patents is proof that people are looking for an easier and more simplified way of living.[21]

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[21]Cf., U.S., Congress, House, A Statistical Abstract of the United States, 87th Cong., 2d Sess., 1962, House Doc. No. 342, p. 547.

CHAPTER III

APPLICATION OF WORK SIMPLIFICATION TECHNIQUES

Techniques

Work simplification techniques have been designed basically to simplify the daily tasks inherent in all operations. Since there is nothing technical or complex about their application, previous specialized knowledge of procedures or systems survey work is not a requisite to their use.

The simplification program is not based on the introduction of highly technical studies by so-called "experts." It has been designed for the use of operating personnel in the field. The underlying principle behind this approach is that the operating and key personnel, being closest to the work, undoubtedly possess the greatest source of ideas on how the work may be done in a better way. The expert approach involves bringing in an outsider or staff person who can tell what is being done incorrectly. Frequently, this individual is not wanted by the people doing the work and by those responsible for the work. This lack of acceptance of the expert results in considerable hostility and lack of cooperation. The expert gives the line and staff personnel a feeling of insecurity, for he is critical.

Allan H. Mogensen, director, Work Simplification Conferences, Lake Placid, New York, and Sea Island, Georgia, says: "We must convince people that we want them to work smarter, not harder."[22]

Mr. Mogensen contends that work simplification makes the employee responsible for, and capable of, policing the efficiency of his own job. His goal is to reduce the operation to its simplest, easiest, and least costly form.

Work simplification works for everyone, everywhere. It works for the chief executive, the armed services, the factory, the office, the home, and even the basement workshop. Every job can be improved. If a job has already been improved once it does not mean it cannot be improved again. The slogan, "If it works, it's already obsolete" should be a philosophy toward mental complacence. Never be satisfied that the ultimate has been reached.

Allan Mogensen says: "The largest obstacle to be overcome in a work simplification program is the mental attitude of people who already believe that they are doing their job the one best way."[23] The only "one best way" of doing any task is to eliminate it completely.

Applied to the armed services where the only profit is higher efficiency and combat readiness, it is imperative that

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[22] Work Simplification Program (Dallas, Texas: Chance-Vought Aircraft, 1960), Chapter II, pp. 3-4, quoting Steel, The Metalworking Weekly, September 29, 1958.

[23] Ibid.

waste of men, money, and materials be eliminated. Work simplification boosts efficiency and combat readiness by upgrading personnel productivity. It must be remembered though, that anyone who deals with a new method should participate in its development if at all possible. Time and effort can be conserved and better end-results achieved through the application of work simplification techniques. If one is looking for an improved method of doing something, he may follow six basic steps:

Step 1. Selecting the job to be improved.--One should select a job which is necessary to the ultimate goal or achievement necessary. Locate the problems, analyze them, and ask the question: "Is it worth improving?".

A good way to start is to confine oneself, at first, to those things one does or controls himself. By selecting something which is his responsibility he will get through it easily and quickly. If, however, he picks a job on which he has no firsthand knowledge of the facts, and which is the responsibility of other divisions or commands other than his own, the work of improvement is going to be more complicated. This can better be said as, "people who live in glass houses shouldn't throw stones."

It must be remembered at all times that all of us, to some extent, resist change and resent criticism. Starting with ourselves and the jobs under our own responsibility will do much to teach us about these factors and prepare us to handle them properly in dealing with others.

Mr. Harold F. Smiddy once said:

> We have come to recognize that the work of any job in an organization structure is composed of two parts. The first of these is what we do ourselves, no matter what position or status we enjoy; the second is how we reference our personal activities into the work of others. We have found this idea so helpful in our business orientation, that we customarily speak, now, not of "work" alone, but use the phrase "work and teamwork."
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> It is this teamwork which is brought into being by integrating--by the proper and effective interpretation and communication of the business objectives, as well as by other parts of this process.[24]

It is easy to approach the same bad situation day after day without seeing it. One should look for jobs that require a great deal of walking and "messing around." Good prospects to begin with are those that involve a lot of uncomfortable and tiring physical effort.

One should take a look at the high cost of operations, the bottlenecks, and the activities that are very time consuming. Almost every activity in the command can be subjected to improvement, but the objective should be to have everyone thinking about projects at his own level of responsibility.

Step 2. Getting the facts--Process Charts. This next step of the work simplification program is a very important one. The eventual success of any improvement at which one arrives will nearly always depend on whether or not he accumulates all the facts in Step 2 which affect the job he has

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[24] Harold F. Smiddy, Integrating and Motivating for Effective Performance. Remarks made at the Executive Leadership Conference, Cornell University Ithaca, New York, on February 18, 1955. (New York: General Electric Company, Management Consultation Services, June 2, 1955), p. 25.

picked to improve. If he overlooks essential facts at this stage, the improvement which he suggests may not be accepted and therefore he has wasted his effort.

In gathering the facts one should look at the situation from the standpoint of the other person. Then one should ask two simple questions: (1) "What facts do we have?" and (2) "What facts can we obtain?" Facts that are typically available within an organization include specifications, orders, regulations, procedures, material lists, related equipment, blueprints, time studies, production processes, schedules, job descriptions, sample of parts, materials, or forms. Facts we may obtain include process charts, flow diagrams, models and mock ups, information from representatives of the company which produces the product one is working with, vendors, customers or even competitors, mathematical models, technical data, surveys, and illustrations from periodicals and business papers.

The magnitude and importance of the project will have to tell one the amount of information that is practical to assemble to provide an adequate base for the ensuing steps. One must be certain he gets the facts now and not later. Above all, beware of the "flash improvement." Quite often the suggestions or ideas expressed by others at this stage appear to be of use in this particular problem. Unfortunately, however, the flash improvement is too often offered before the full facts are presented concerning the job to be improved. People tend to oversimplify solutions into propositions and to debate them

rather than to develop them.[25]

Although great latitude is covered in gathering the facts, the human element cannot be forgotten. In Mason Haire's book, Organization Theory; Research on Human Behavior, he says:

> Over-specification of individual tasks, through detailed programming of them by the organization, may tend to suppress individual job changes and innovations. Over-specification of a task, for those performing it, implies a "best way" for carrying out the task that is organizationally determined and legitimized. An uncertainty may develop for the individual worker as to whether it is possible to make individual task changes. Even if made, there is the secondary uncertainty about the purposes to which the task change will be put. An obvious solution to the second uncertainty is restriction of output to minimum acceptable levels, which usually takes considerable knowledge and subtle familiarity with a task to accomplish.[26]

The entire process of making a part or performing an operation must be studied before trying to improve the detail. Look at the big picture. Get all the facts. Do not improve an operation that can be eliminated. How does one know all this unless he gets the complete story? Such an overall study will include an analysis of each step in the process or operation. An overall investigation might show that entire operations or series may be eliminated. After analyzing the entire process and determining which steps are necessary, one can then study each remaining step in detail for improvements or simplification.

Flow Process Chart

The flow process chart (see Exhibit 1) is a device for

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[25]Rupert L. Cortright, and George L. Hinds, Creative Discussion (New York: The Macmillan Company, 1959), p. 68.

[26](New York: John Wiley and Sons, Inc., 1959), p. 240.

EXHIBIT 1

FLOW PROCESS CHART

NUMBER	PAGE NO.	NO. OF PAGES

☐ MATERIAL

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DATE

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SUMMARY

ACTIONS	PRESENT NO.	PRESENT TIME	PROPOSED NO.	PROPOSED TIME	DIFFERENCE NO.	DIFFERENCE TIME
○ OPERATIONS						
⇨ TRANSPORTATIONS						
☐ INSPECTIONS						
D DELAYS						
▽ STORAGES						
DISTANCE TRAVELLED *(Feet)*						

S OF ☐ PRESENT ☐ PROPOSED METHOD

OPERATION ○ TRANSPORTATION ⇨ INSPECTION ☐ DELAY D STORAGE ▽	DISTANCE IN FEET	QUANTITY	TIME	ANALYSIS WHY? WHAT?	WHERE?	WHEN?	WHO?	HOW?	NOTES	ANALYSIS ELIMINATE	COMBINE	CHNGE SEQUENCE	PLACE	PERSON	IMPROVE
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DETAILS OF ☐ PRESENT ☐ PROPOSED METHOD	OPERATION / TRANSPORTATION / INSPECTION / DELAY / STORAGE	DISTANCE IN FEET	QUANTITY	TIME	ANALYSIS — WHY? WHAT?	WHERE?	WHEN?	WHO?	HOW?	NOTES	ANA — ELIMINATE	COMBINE
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recording in a compact manner each step of a job as a means of better understanding and improving it. The chart represents graphically the separate steps or events which occur during the performance of a piece of work or during a series of actions. The process chart might be used to record the flow of a unit, a section, a department, or between departments. The flow process chart has no bounds. No matter how complicated or intricate the series of operations may be, a process chart can be constructed if taken one step at a time. The process chart, however, like other methods of graphic representation, should be modified to meet the particular situation. For example, it may show in sequence the activities of a person, or it may show in sequence the steps that a man, part, or material goes through. The chart should be either the man-type or the material-type and the two types should not be combined.[27]

A careful study of this chart, which gives a graphic picture of every step in the process, is almost certain to suggest improvements. It is not uncommon to find that some operations, or a part of an operation, can be eliminated; that one operation can be combined with another; better routes for the parts may be found; more economical machines may be used; delays between operations can be eliminated; and other improvements may be made; all of which will permit the production of a better product at a lower cost or higher efficiency with less energy expended.

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[27] Cf., Marvin E. Mundel, Motion and Time Study (New York: Prentice-Hall, Inc., 1950), p. 40; and, Nadler, op. cit., p. 63.

Step 3. Challenging every detail.--The third step of the work simplification program involves the challenging of every part, aspect, or detail of the job. Put each operation of the job "on trial." Ask pointed questions about it. Do not be satisfied until all questions possible have been asked and the related "why" answers have been received. For example, the first thing to do is to challenge the whole job being studied. Why is it done? Is the job actually necessary? If the answer to the last question is in the affirmative, then challenge each operation of that job.

The questioning attitude one must strive for develops a point of view which considers the good of the whole job rather than that of any one department or individual; it eliminates useless and unnecessary work which adds no real value to the end product; it brings out the best type of worker and equipment needed; it determines where the work can be most economically performed; and it even cuts the flow of work. By challenging every step, it often develops that a particular part of the job, or sometimes the entire job, is unnecessary.

Here the value of the open mind becomes apparent. It is not easy to take an operation, especially a familiar one, and ask the question "why?" It is almost impossible to take a stand and say that something cannot be done and then work conscientiously to improve it. We all know "can't" never accomplished anything. If one is expecting to get results from an analysis of the process chart, he must take the attitude from the start that it can be improved.

Better progress can usually be made by having several people in the study of the process chart. Secure suggestions from those working directly on the operation. Some of the most valuable suggestions have come from the person doing the job. Asking for his help during this stage often clears the way for gaining acceptance of the improvement which will later be installed.

The people who have to carry out the decision should always participate in the work of developing alternatives. This is also likely to improve the quality of the final decision, by revealing points that the manager may have missed, spotting hidden difficulties, and uncovering available but unused resources.[28]

The questioning attitude cannot be content with the past way or the present way the operation is accomplished. There is a better way and it has to be found. Here are the questions to ask of each operation and detail of the job:

1. What? What is done? What is the purpose of doing it? Why should it be done? The answers to these questions determine the value or useful purpose of doing the particular operation under consideration. You want to know whether this detail is doing what it is supposed to do.

2. Where? Where is the operation being done? Where is the best place to do it? Why should it be done there? Where else could it be done? These questions are asked to be sure that,

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[28]Peter Ferdinand Drucker, The Practice of Management (New York: Harper and Bros., 1954), p. 156.

if the operation is necessary, it is done in the right place.

3. When? When is the operation done? When is the best time to do it? Why should it be done then? These questions are asked to be sure that if the detail is necessary it is done at the right time. Should it be done at the same time as some other operation? Should it be done before some other operation? Should it be done after some other operation?

4. Who? Who does the operation? Who should do it? Why should this person do it? Can less skilled people do this job? These questions are asked to be sure that the right person is doing the work.

5. How? How is the operation performed? Why is it done that way? Can it be made easier to do and safer for both personnel and equipment?

6. Why? Why is it done?

The facts presented will be the answers to what, where, when, who and how. The reasoning behind the facts is the answer when asked "why?" The ability to ask "why?" is often responsible for unusual success on the part of an outside person analyzing the operations for possible problems. Arriving on the scene for the first time, he naturally asks this at every step, and in many instances finds the answer is that "it has always been done that way." If that is the only reason, then he certainly questions "why?"

After analyzing the answers to the questions, the answers to the problems must be correlated to arrive at possibilities.

Again, one may ask: "Can we eliminate? Can we combine? Can we change a sequence, the place, the person? or, Can we improve the operation?" These are all possibilities, but we need to advance to Step 4.

Step 4. Developing preferred methods.--The development of an improved or preferred method must be based upon the facts already presented in Step 3. Now the different charts must be analyzed: flow, process, time, work distribution, work count, layout, and others.[29]

One does not need to be an expert in the process being studied, but must possess the essential facts so that judgment and common sense can operate on a firm basis.

One should begin by working with facts and not opinions. Opinions lead to arguments or resistance to change. Facts lead to conclusions and results. Secondly, one should work with causes and not effects--one would not keep putting air in a slow leaking tire--he would have it replaced or repaired. Thirdly, work with reasons and not excuses. An excuse is an escape and dodges the question. Find out why the operation is handled in detail as the chart shows. Develop the questioning attitude further. Ultimately one will discover the reason why.

Undoubtedly the greatest savings could be made if the job could be eliminated completely. One must be absolutely positive that the job cannot be eliminated before attempting to work out a better way of doing it. Try to combine the job

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[29]Mundel, op. cit., p. 40.

with something else; consider the possibilities of combining one phase with another, thereby having greater utilization of resources.

The use of the flow chart will help to spot the possibilities of changing the sequences, place, and person by emphasizing the amount of travel and back-tracking involved. Many flow charts show that work is done in a particular shop "because it has always been done there." Work should be done in the right place at the right time by the right person.

The improvements should be classified. Are they conservative or radical improvements? Conservative improvements are those which can be installed with tools, materials, equipment, and authority available to the personnel working on the improvement in question. The radical improvements are those requiring the approval of higher authority or the expenditure of large sums of money. Here it can be seen that a radical improvement at a lower position in the command could be considered a conservative improvement at the top.

A researcher must proceed further and evaluate the old method as compared to the new method. It is tempting at times with some improvements to rush in an install them before it has been figured out how much better they are than the old ones. This can result in simply a change and not an improvement. He must calculate the cost of installing the improvement. One should ask these questions: Will this improvement have adverse effects on any other part of the organization if it is accepted? Will this improvement have hidden additional costs or require

additional personnel or specialists not anticipated? If the answers are affirmative, these costs must be determined and consideration must also be given to human reactions and relations. The proposal should be evaluated from the human as well as the economical point of view and each must be given equal weight. One must have improvements but if they are going to disrupt the work habits, authority, responsibilities, etc., of people, they must be carefully evaluated.

Marshall and Dimock's book, Administrative Vitality; The Conflict with Bureaucracy, says that order is based on rational arrangement, priorities, logical distribution of functions, and clear categories. But a blind reliance on these factors causes an accumulation of excessively complicated and formal procedures which destroy efficiency and morale, whereas a proper handling of them is the basis for work simplification which is an aspect of vitality.[30]

Now, after the above evaluations would be the time to give the improvement a trial run if possible. This trial run may change the original estimate of cost or thoughts about whether the improvement is practical. This experiment, or trial run, also becomes the first step in involving everyone concerned with the final results.[31]

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[30](New York: Harper and Bros., 1959), p. 298.

[31]Drucker, op. cit., p. 156.

CHAPTER IV

PREREQUISITES FOR INSTALLING A WORK SIMPLIFICATION SYSTEM

Step 5. Installing the improvements.--The ultimate objective of the first four steps is the effective installation of the improvement. None of the previous steps taken has been worth the time or effort if this objective is not attained.

Work simplification is not new. It is not a speed-up program. It does not mean asking anyone to work harder or faster. It is a program which appeals to the "intelligent selfishiness" of every individual.

Getting Results Through People

There are three ways of getting results through people. One can: (1) tell them, (2) sell them, (3) consult them.

Failure to realize the benefits of scientific management in the past may be due to the method in which these techniques have been introduced. Most of the application, unfortunately, has been of the "tell them" variety. Supervisors have often resorted to driving, instead of leading--again, the "tell them" approach. Industry, too, has failed to explain its workings and fundamental economics, with resultant misunderstandings.

Efforts have been made to sell people on the need for increasing productivity, and far better results are obtained than by the "tell them" method. In the same way, there has been a much better job of explaining such techniques as time studies, material conversion, production planning and control, job evaluations, lead and lag times, and others. Therefore, the "sell them" approach has paid off.

The work done at Western Electric by Mayo and Roethlisberger disclosed, among other things, that:

> The worker occupies a unique position in the social organization. He is at the bottom level of a highly stratified organization. He is always in the position of having to accommodate himself to the changes which he does not initiate. Although he participates least in the technical organization, he bears the brunt of most of its activities. Because of his position in the social organization, he cannot hold to the same degree of sentiments of those who are instituting the changes.[32]

Some of the best results are obtained when one consults people. The simple act of seeking help from those who are involved in or affected by a problem gives the essence of meaning by the consultative approach. In order to be effective, however, the act of consulting must take place when the problem arises, and not after it has already begun to slow the operation.

Intelligent Action

If work simplification is not new, and it seems natural that everyone should wish to find easier and better ways of doing work, why, then, do we have trouble in getting action?

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[32]Fritz Jules Roethlisberger, Management and the Worker (Cambridge, Mass.: Harvard University Press, 1939), p. 67.

There are three primary factors which bear upon the intelligence of the individual, i.e., (1) his desire to solve the problem, (2) his ability to solve it, (3) his capacity for handling the human relations involved.

Desire

Do most people have the desire to find easier and better ways of doing work? In view of the problem of trying to raise productivity and efficiency the world over, it might be questioned. The extent to which anyone is interested to do anything depends entirely on the nature and the intensity of his desires. In simpler terms, it can be said that there are only two reasons why anybody desires to do anything: (1) because he desires to gain something, or (2) because he desires to avoid losing something.

Do most people feel that they will gain something from increased productivity? Remember, people's actions are determined largely by what they believe. If the things that they believe are wrong, their actions in respect to such beliefs are likely to be ill-advised, both from their own standpoint and from that of the public at large. The failure to understand a few simple economic facts of life gives cause for labor unrest.

In the past, the thinking of the people on how wealth is produced and distributed has been very weak. Understandably, there has been a strong demand for higher living standards--better houses, pensions, cars, better food, medical benefits, education, life insurance, leisure--and the economy has produced

these things in extraordinary abundance. But people have been led to look upon "freedom from want" as a right, rather than something that must be earned.

Actual evidence of the way the capitalistic system shares--automobiles, telephones, radios, televisions, life insurance policies, and others--are all about us. The public is knee-deep in the wealth of sharing. This is evidence that everyone should abandon once and for all the widely held concept that "good deeds speak for themselves." The military's own experience does not bear this out. Good deeds must constantly be interpreted, or people will blame the military for bad deeds.

The only way, actually, to increase the average income and purchasing power of the worker is to find the means to increase his productivity. There is no theory about this, although few people seem able or willing to understand it. Whenever we do increase a worker's productivity, nothing has ever prevented the worker from benefiting in proportion to his individual contribution to the increase.

Therefore, if people can be convinced that they will gain from increased productivity, rather than lose from it, one will receive the cooperation he wants and needs. Many attempts have been made in the past to increase productivity, but most of them have ignored the ideas of the person doing the job.[33]

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[33]Taylor, op. cit., p. 8.

Ability

Do people have the ability to apply work simplification? Charles R. Darwin, the famous naturalist, once said: "There are more people with adequate brains than we think, but they lack the quality of enthusiasm that is hard to define."[34]

James. F. Lincoln, head of Lincoln Electric Company, has said:

> Great as American industry is, it leaves largely untapped its greatest resource, the productive power, initiative, and intelligence latent in every person.
>
> This cannot be done by human beings except by the exploitation of the driving force fundamental in all of us, namely, selfishness. Selfishness has a bad reputation, but that is because of a narrow conception as to what it really is. No program involving the human race, developed as it has been through the ages on the concept of the "survival of the fittest," can be found on any other principle than selfishness. The only necessary corollary to this principle to make it attractive, helpful and satisfactory to all concerned is to make the selfishness intelligent. The greatest heights we attain as humans--patriotism, parenthood, and friendship--are all based on the same trait--selfishness.[35]

Capacity for Human Relations

Do we as commanders or executives have the capacity for handling the human relations involved? The Hawthorne experiment demonstrated clearly the tremendous importance of the human factor in industrial production.[36]

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[34] The Origin of Species and The Descent of Man (New York: The Modern Library, 1936), p. 445.

[35] James Finney Lincoln, Incentive Management (Cleveland: Lincoln Electric Company, 1951), pp. 11-12.

[36] Cf., Roethlisberger, Management and Morale (Cambridge, Mass.: Harvard University Press, 1941); and Roethlisberger and Dickson, Management and the Worker (Cambridge, Mass.: Harvard University Press, 1941).

Resistance to Change and Criticism

As far as work simplification is concerned, and getting action in finding easier and better ways of doing work, it is relatively simple. We must recognize the existence of two outstanding traits of human nature, i.e., it is human nature to resist change and to resist criticism.

Dr. Albert Walton said:

> Complacency, the feeling that all's right with the world, especially with us, is a comfortable feeling. . . . It is when we fear that this comfortable state of affairs may be upset, we act to restore it. It is doubtful if we ever do anything at any time except to prevent our complacency from being disturbed, or to recover it if it has been disrupted.[37]

Very few individuals will fail to see the necessity for improvement in methods. Very few will find fault with the objective. However, they may foresee in a program a threat to their complacency, and for this reason may resist with almost stubborn determination.

Being human, we resist change. Resistance to change is frequently cited as a cause of trouble in improving production or the handling of paper work through better methods. Some people excuse their resistance to change on the basis that they are human. Is it normal? Is it the cause or the effect? If a worker suggests a better method of improving his own operation, he is inclined to work more happily if it is adopted. But he will not come up with a change unless he is motivated and if he has acquired a thinking habit.

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[37] Quoted in Work Simplification Program, op. cit.

Some of the more common expressions and comments heard every day at all levels of the command or company which retard progress due to the extreme negativism which they imply are:

"It isn't in the budget."
"It won't work in our department."
"It's too radical a change."
"Not practical for operating people."
"The union will scream."
"We've never done it before."
"Why change it; it's still working O.K."
"Can't teach an old dog new tricks."
"We did all right without it."
"Let's shelve it for the time being."
"Has anyone else tried it?"

Reluctance to accept a new idea because of fear of change and the disruption of a comfortable routine is a dangerous way to approach problem solving. The creation of a constructive and practical idea through work simplification does not mean there will be wasted money. The organization which encourages creative efforts by its personnel automatically encourages a commodity precious to every individual initiative. Management on all levels which has respect for the contributions of personnel thinking has a greater chance for success. There must exist a climate for ideas. A manager who wants to "run the whole show" and ignores the observations of his personnel, does permanent damage to morale and insures, once and for all, that his personnel will never again have the courage to suggest a constructive change. Because creative ideas cannot come about in a hostile atmosphere, one must put aside occasional moments of discouragement and make a consistent effort to build a positive atmosphere which will better serve the efforts to maximize effectiveness and combat readiness.

In the same way, the new is resisted. Like the parachute, the mind functions only when open. When somebody presents a new idea, what is done about it? Is it not true that one of the remarks made is that it cannot be done? What was the original reaction to jet airplanes, orbiting the earth, placing a man on the moon, and many other experiences which are in everyday conversation? What would the reaction have been if someone had observed that it is not uncommon to fly faster than the speed of sound or that automatic data processing machines could produce alternatives for decisions faster than a staff of many hundreds of workers?

The gyroscope is a splendid physical example of this resistance to change. Although it changes position slowly, a sudden or abrupt change will be resisted with unbelievable force, and if too abrupt, it will be destroyed.

We must keep this human failing in front of us throughout every day of our life--if we are to get along with people. The moment we forget this, we are wasting time and effort, and results will be disappointing.

If criticism is so good for us, why do we constantly resent it? We would much rather be told that we are right, and most of us, when asked for advice, merely want to have our own good opinions of ourselves verified. If we do not get this, we are likely to dismiss the advice and not follow it.

The foregoing was stated succinctly by Thomas A. Edison in his observation:

> There is no truer test of a man's qualities for permanent success than the way he takes criticism. The little man can't stand it. It pricks his egotism. He "crawfishes." He makes excuses. Then, when he finds that excuses won't take the place of results, he sulks and pouts. It never occurs to him that he might profit from experience.[38]

Work done effectively is accomplished by eliminating unnecessary parts of the job. Work done in a hurry will give poor results because it is a speeding up of all parts of the job--both necessary and unnecessary.

As preached to the writer all his life by his father, "Anything worth doing is worth doing right." Analyzing this, it is true that the time spent doing an operation haphazardly will cause the necessity of repeating the operation in the correct manner the second time. This is a definite waste of the initial time and effort expended.

Reasons for Progress--Inventions and Competition

New inventions are the product of an unsatisfied mind. There exists that occasional individual who is intensely interested in trying to make something better. In 1962 alone, there were 88,340 patent applications filed for which 51,152 patents were issued. Of this 51,152 issued, 48,368 were for inventions.[39]

Competition has been called the "Great Universal Supervisor," for it is the force that puts us to work or out of work. There are rare cases where companies which have no

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[38]Quoted in Work Simplification Program, op. cit.

[39]U.S., Congress, op. cit., p. 547.

competition make continual improvements in quality or service, or voluntarily reduce their prices; but they are few, and most people take the line of least resistance and require competition to force them to change and improve.

Our Economic Development

In the year 1850, when most work was done by animals and man, animals were doing one-half our work; man power, one-fifth; and machine power, only about one-third. Hence, the dollar value of output per worker per hour in 1850, was only about twenty-seven cents in today's buying power. This means that we worked long hours for a low yield, and it also means that we had few of the comforts and conveniences in our homes that we enjoy today. But times were changing even then.

Next we follow the slow and steady increase in productivity that accompanied the technological revolution after 1850. By 1900, animal power was doing only one-third of our work, man power was doing only one-sixth, while machines were doing over one-half of the work. Our output per worker per hour was sixty-seven cents in present day buying power, double what it had been in 1850.

We next see the tremendous increase in our mastery of machine power from 1900 to the present. We review the growth of industry and the development of mass production techniques. We find that today, animals and men are doing only about six per cent of the work, while machines are doing ninety-four per cent. As a result, output per worker per hour has risen to $1.40--five times what it was in 1850. The hours of work have

decreased from about seventy a week to about forty--and most important of all, our per capital income has increased five-fold in a century.[40]

Man's fear of machines, technological changes, automation, and methods improvement is a fear of losing his job. Remember that this fear is deep rooted. Sweatshops of long hours, low wages, and "forced" production are not far in the past.[41]

Every wage earner reacts to a new development in accordance with what he feels will be its direct effect on him as an individual. However, consider two things--facts or logic, and sentiments or opinions.

What Is Work

What is work? What do we know about it? We know: (1) some people do not like to work; (2) some people do not know how to work.

Take the first one. Do we know many people who really like to work? Do we like to work ourselves? Do we get fun out of it, or do we get the most of our fun planning what is going to be done when we are through with work?

Do we know how to work? Do we work in a routine? As a result of day to day routines, people develop special preferences, antipathies, discriminations and emphases. These

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[40] Work Simplification Program, op. cit.

[41] Cf., Taylor, op. cit.

psychoses develop through demands put upon the individual by the particular organization of his occupational role.[42]

How efficient are we? Walter Dill Scott, President Emeritus of Northwestern University, has said that the average man could, with no injury to his health, increase his efficiency by fifty per cent.[43]

William James in his "Energies of Man" said:

> The human individual lives actually within his limits. He possesses powers of various sorts which he habitually fails to use. . . . He develops because of crises and incentives. He must first have the opportunity, which is freedom, and secondly, the reason, which is incentive.[44]

Waste and Productivity

When people do not like to work, or do not know how to work, they waste time, energy, and materials. Waste causes high prices in industry, and poor efficiency and utilization in the military.

More efficient performance results in shorter time spent per job in industry and better operation in the military--also less time per job or operation for personnel. This means men and equipment are made available for more work or operations resulting in greater productivity or efficiency.

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[42] Psychosis is used to denote a "pronounced character of the mind." Kenneth Black, Performance and Change (New York: New Republic, 1935), pp. 58-59.

[43] Walter Dill Scott, Robert C. Clothier, and William R. Spriegel, Personnel Management (New York: McGraw-Hill Book Company, Inc., 1954), p. 174.

[44] Memories and Studies, (New York: Longmans, Green and Company, 1912), p. 230.

CHAPTER V

WORK SIMPLIFICATION IN THE NAVY OVERHAUL AND REPAIR DEPARTMENT

History of O & R

The O & R Department was started at Cherry Point, North Carolina, in 1942. It functioned throughout the years as a stratified maintenance activity accomplishing the overhaul and repair on aircraft as then depicted by the Bureau of Aeronautics of the Department of the Navy.

In 1954, there was a reorganization in the different O & R's throughout the United States. There appeared for the first time a standards program. The George H. Elliot Company, manufacturing and engineering consultants, was hired by the Bureau of Aeronautics to introduce a standards program. Its representatives evaluated the program, made some suggestions and eventually proposed some standards. Where did they get these standards? Past performance was the basis for their establishment. The O & R Department had been conscious of standards since 1949, and had used them in such areas as methods checks and quality control. But the O & R Department had not called them standards. They had called them "quality specifications." This organizational change had a terrific impact upon the quality control section of O & R, and the

ultimate decision of the Elliot Company was to expand the quality control section. This created marked disruption, but proved to an excellent change. Today it is called quality assurance, and the majority of the work is accomplished through statistical quality control, thereby saving many manhours and dollars of expense.

The outcome of this quality assurance has led to better quality at less cost and a reduction in end process time.

Another significant measurement the Elliot Company wanted to utilize was to measure the performance of people. Since there is no timekeeper in each shop, due to the expense, this proposal proved too expensive and the worker did not perform at the regular rate. The Elliot Company did believe it could disclose a satisfactory method. This was the job card method. This method said the job was constant and the individual was variable, which proved unreasonable for the O & R Department, since the job could not be constant. Therefore the O & R Department used the reverse and said the individual was constant and the job was variable. This practice is still being used today.

Since there is no monetary profit derived in an O & R Department, how do they measure profits? The profits are synonymous with the profits derived in the military services. The department must produce quality as quickly as possible at the least cost. This will ultimately lead to additional contracts. It must be remembered that these contracts are not passed around at random to help on national economy but are bid

upon in a very competitive manner. Therefore, the marketability of the O & R product must be viewed, not only from the monetary or quality standpoint, but from the efficiency or quantity standpoint as well. This is arrived at by effective and efficient direction and coordination.

O & R Organizational Structure

The organizational structure of the O & R Department, Marine Corps Air Station, Cherry Point, North Carolina, as shown in Exhibit 2, appears complex, but throughout there is decentralized control and effective action and operations.

Headed by the Officer in Charge and moving laterally is shown the Administrative Services Group, designated 100, and the Management Control Group, designated 200. Below the Officer in Charge is the Production Planning Group, designated 500, and the Production Engineering Group, designated 600. Within the Production Engineering Group is designated the 620 and 630 divisions representing the operations analysis, and methods and standards divisions respectively. In the 620 and 630 divisions reside the majority of the work accomplished pertaining to work simplification and all the related aspects of work simplification.

Objectives of Work Simplification and Related Aspects

Since there is no division called "work simplification" one might assume that the O & R Department did not practice it. This assumption would be entirely wrong. How, then, do they utilize work simplification?

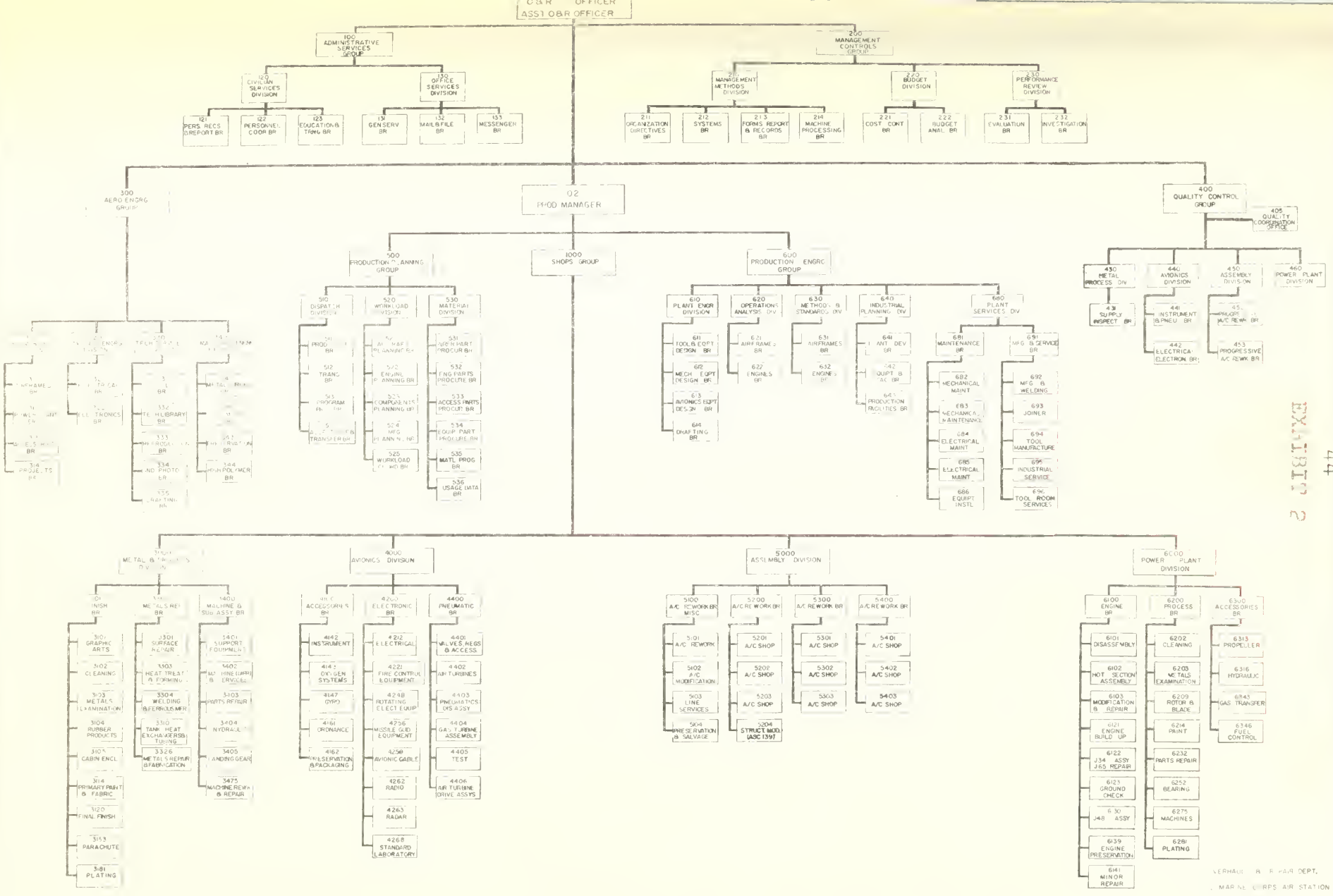

EXHIBIT C

44

OVERHAUL & REPAIR DEPT.
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

DATE: 1 JAN 1962

APPROVED _____

J. H. CLARK COL. U.S.M.C.
OVERHAUL & REPAIR OFFICER

Since practically all the techniques of management engineering exist in the O & R Department, they must analyze the techniques which have been used before and new ones being used at present and apply them when and where possible. It must be understood first of all that the O & R Department is not like a production line where the aircraft move along to the different shops. The aircraft are placed in "stalls" where the workers are employed. Therefore, the operations utilized in industry very seldom appear in the O & R Department.

The O & R Department has established what is called "Examination and Evaluation." This is derived from aircraft entering overhaul. Their component parts are removed and sent to their respective shops where they are examined and evaluated, worked on if necessary, returned to the aircraft and installed. This means an aircraft leaves with the same component parts it arrived with.

This process differs from the Air Force overhaul program. The Air Force aircraft enters overhaul, the component parts are removed, like items are installed and the aircraft is ready to fly much sooner than Navy or Marine aircraft. What happens to the components which were on the Air Force aircraft? They are sent for examination and evaluation to a subsidiary plant which specializes in those component parts and are returned at a later time to be installed in a different aircraft of the same type.

The process in the O & R Department is one resistant to the work simplification process since efficiency can never be developed on a one-unit-at-a-time basis.

Work Simplification System--Location and Control

The work simplification aspect is located in the 630 division, called Methods and Standards. This shop came into prominence in an unusual way. There was a reduction in the labor force and a Methods and Standards Division was maintained because the Bureau of Aeronautics said there would be one. At that time, Mr. Beaver, now Head of Division 630, was one of the fortunate people to remain employed. Basically, there was no work for this shop since it had no authority or backing. But to remain effective, the 630 division assisted other divisions. It was then that Mr. Beaver started doing as much with what he had, making no savings reports to verify his accomplishments. He tried to help everyone to do his job from the standpoint of methods improvement and work simplification to make it more practical from the O & R standpoint. This gradually progressed and was followed by savings reports, further studies, and adaptations which led Mr. Beaver to be advanced to Division Head. The practice of adapting the significant aspects of industry and commercial uses of work simplification to the practical aspect of O & R is still practiced today. Through the use of flow and process charts and other modern management engineering tools there has been a significant increase in the quality and quantity of the work at O & R Department.

Less Cost of Overhaul and Repair through Work Simplification

Examination of Exhibit 3 gives an approximate initial investment cost of today's aircraft. Although the O & R Department does not perform all the rework and repair for all these different types of aircraft, it does submit bids for a significant number. An example of one overhaul is the F4H-1. With the cost for a modern aircraft as high as it is today, it is imperative that the work be accomplished as cheaply as possible in the shortest time possible. Therefore, through work simplification and the related tools which are available to the O & R Department, it is able to submit bids that are within the perspective of the annual budget and to give the military services a quality product.

Examination of Exhibit 4, specifically noting airframe overhaul, gives the approximate costs for the related parts of the aircraft. If the O & R Department did not have some type of work simplification and related management engineering tools the costs of repair for the related components of the aircraft would vary from aircraft to aircraft, due to the human variations of the employees. The use of work measurement, operations analysis, systems and procedures, and effective management keep these costs relatively stable. Although they use the learning curve and previously applied methods, they still cannot tell which aircraft will require the most work until they start taking it apart, piece by piece. Therefore it is difficult to

EXHIBIT 3

INITIAL INVESTMENT COSTS OF SELECTED AIRCRAFT

FY 1962[a]

(In thousands of dollars)[b]

	Initial Investment Costs[c]
Fighter	
FJ-3	$ 390
F8U-1	800
F8U-2N	1,150
F9F-8	300
F4H-1	2,500
Attack	
A4D-1	$ 490
A4D-2N	540
A4D-5	700
FJ-4B	560
Transport	
GV-1	$ 3,050
Training	
T2V-1	$ 470
T28C	130
F9F-8T	365

[a]Source: U.S., Department of the Navy, Office of Comptroller, Cost Estimates of Weapons; Ships, Aircraft and Task Forces, Fiscal Year 1962, NAVEXOS P-1986, March 31, 1961.

[b]All figures approximate for confidential purposes.

[c]Less spares.

EXHIBIT 4

ESTIMATED ANNUAL MAINTENANCE AND OPERATING COSTS OF SELECTED ACTIVE AIRCRAFT, FY 1962[a]
(In dollars)[b]

	TOTAL	PERSONNEL	ALL OTHER	AIRCRAFT OPERATIONS	AIRFRAME OVERHAUL	ENGINE OVERHAUL	AFA	OTHER SUPPORT
Fighter								
FJ-4	$106,200	$11,250	$ 94,900	$ 16,000	$ 9,500	$ 2,900	$ 58,250	$ 8,100
F8U-1/1E/1P	179,500	17,300	167,100	29,000	17,300	6,360	90,000	15,400
F8U-2	179,600	11,280	168,370	29,000	17,300	7,250	98,750	16,000
F8U-2N	182,500	11,280	171,300	29,000	17,300	8,900	98,950	17,100
Attack								
A4D-1/2/2N	137,450	14,000	123,400	24,100	16,450	4,300	64,950	13,500
A4D-5	182,150	14,000	168,100	24,100	16,450	36,500	56,500	34,500
FJ-4B	133,000	14,000	118,900	19,000	9,500	2,900	79,300	8,100
Transport								
GV-1	942,400	51,950	890,500	176,850	35,250	15,800	629,250	33,250
R4D-5/5Z/6/ 7/8/8Z	118,800	51,900	66,900	18,000	9,200	2,700	29,150	7,750
Training								
T2V-1	87,150	19,800	67,350	11,150	11,450	1,750	34,300	8,600
T-28B/C/D	59,950	19,800	40,100	6,100	7,600	2,100	17,800	6,400
T2F-1T	113,750	19,800	93,950	25,600	10,750	1,300	48,350	7,800

[a]Source: U.S., Cost Estimates, op. cit.

[b]All figures approximate for confidential purposes.

compare the costs of one aircraft with another. To say they have a cost-plus-fixed-fee contract would be untrue. Here one can see that their profits are measured through the use of work simplification and the related management tools.

CHAPTER VI

APPLICATION OF WORK SIMPLIFICATION IN A TACTICAL AIRCRAFT SQUADRON

What Can Work Simplification Do

The conscientious use of work simplification techniques has numerous and far reaching results. Those most commonly achieved are:

1. Increased job satisfaction and improved morale through making the work easier to perform.
2. Reduction in the number and cost of operations by eliminating unnecessary steps and combining or eliminating processes in the form of paper work.
3. Improved supervision through increased individual initiative.
4. More effective utilization of personnel by reducing unnecessary reports, transportation, and time.
5. Improved service to the defense of our country through decreasing time and other requirements.
6. Renewed interest of the individual in his job as a result of a clearer understanding of the purpose of his work and the relationship to other work being performed.

7. Provision to everyone in the organization an understanding of what work simplification is and how it will help them and their organization achieve their ultimate mutual objectives.
8. Recognition that all levels of the command are responsible for getting work done and that improvements in work methods can most profitably be developed when these individuals recognize the need for better methods and originate the changes themselves.

Objectives

A well balanced work simplification program is not always easily obtained. It may require a change in the thinking of the higher command as well as at the lowest level. The ultimate objective is a well balanced program which will include every individual in the organization.

In reaching the ultimate in combat readiness and efficiency, the human relations problems which arise must be constantly solved. Some of these problems can be solved through the satisfaction of egos.

Development

An example used extensively in fighter squadrons is the assignment of a person to an aircraft as the plane captain. His name is painted on the aircraft so he can gain recognition. He feels it is "his" aircraft and he develops a sense of ownership. He is proud when his aircraft is flying rather than being the

"hangar queen." This develops into pride of accomplishment and ultimately the work accomplished by the plane captain needs less coordination and direction than that accomplished by plane captains unassigned to aircraft. Granted, there may not be enough aircraft available to assign a plane captain to each, so the motivation of the unassigned must be aroused by having them assigned to check crews who are responsible for a group of aircraft. This also develops into pride of accomplishment. Since the plane captain is responsible for refueling the aircraft and associated operations for routine flights, the check crews are responsible for routine maintenance checks and elimination of discrepancies written up after each flight. The pride of accomplishment is derived from an aircraft returning with no discrepancies.

Where do we get the basis for the development and application of work simplification? For years the different methods or ways of "doing a job easier" were passed down from rank to rank, from squadron to squadron, or basically, by word of mouth. Another important tool was the "learning curve." The more a person performed an operation the more proficient he became. As aircraft became more and more complicated and as technological developments increased, there became a need for specialists. Through schooling and on-the-job training, these developed individuals no longer were required to perform all the different tasks of aircraft maintenance but were assigned

to a phase of the maintenance. Their experience level was high and their work was considered applicable. This brought about the problem of how, when, where, and why must the work be accomplished.

The effectiveness of a squadron is programmed by a syllabus. This includes the training cycle and phase training. The problem of how the work is to be accomplished and by whom, in coordination with meeting the training schedule, has to be solved. Since the aircraft must have periodic maintenance checks and planned progressive maintenance, there must be coordination between shops as to when, where, and by whom the work is to be accomplished. The check crew leader, usually a staff non-commissioned officer, plans the sequence of operations pertaining to the check and gives each shop an approximate dead-line to meet so others may work on the aircraft. It has been found that because of poor logic and planning by the person coordinating the periodic check that one person has to wait while another is working in the cockpit for some reason. This could be eliminated through the use of a process chart or other work simplification tools.

Another example of how work simplification can be utilized is through the physical characteristics of individuals. Take the example of the mechanic who, because of his small size and knowledge of the aircraft, could change a complete fuel control by himself without the usual removal of the tail section of the aircraft. He could remove the fuel control and install a new one in one productive man-hour. Compare this to four

people removing the tail section then only one of them installing the fuel control while three of them stand by and finally all four of them replacing the tail section. This is approximately four man-hours with approximately two and one-half of the four hours wasted, due to the waiting. By capitalizing on the physical characteristics of individuals, resources, and men, money can be saved. This is a savings of all three since it does not tie up ground handling equipment, create unproductive man-hours, or keep the aircraft out of commission longer than necessary. This situation could be considered a bastard situation by some coordinators, since the individual who could change the fuel control in one productive man-hour did not have the leadership to effectively coordinate a check crew.

Manpower Utilization

Complete manpower utilization in a tactical squadron maintenance situation calls for effective leadership and coordination of all shops.

For instance, while an aircraft is flying, the plane captains could be building chocks, washing down the parking ramp, building up tires, holding a "field day" or many other jobs that must be accomplished through the use of idle manpower.

Since the squadron cannot be compared to a modern production plant with work simplification practiced in relation to industrial applications, the individuals and the organization involved must be constantly observed. In commercial aviation, everything is planned and programmed. The commercial carriers know when the aircraft will be programmed for maintenance, where

the maintenance will be performed, and by whom. In contrast, the tactical fighter squadron must be flexible, mobile, and ready for commitments at all times. The men working on the aircraft do not know when or where they will perform the next maintenance operation on an aircraft. It might be in a hangar at their home base, on a carrier, or on some island. This makes the effective utilization of manpower through work simplification very difficult.

Some of the present squadrons maintain what they call a "fly-away" tool chest for this specific reason. In the tool chests are the tools necessary for minor maintenance and repair. They eliminate the large, space consuming tool chests used at the parent station and create an atmosphere of readiness.

Each check crew knows from experience what the most probable discrepancies will be and consequently they inform the supply people with lists of "ready" items available for use in case of immediate deployment.

There have been recent studies about improved maintenance programs.[45] From these studies and other programs that are now in the formulation and completion phase there will develop more effective manpower utilization.[46] As evident in most squadron maintenance functions, men are often pulled off a check to take care of high priority, unscheduled maintenance. This is not uncommon in any activity or job.

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[45]Lt. Jack Davis, USN, "Squadron View of Fleet Work Study," Naval Aviation News, September, 1962, p. 32.

[46]U.S., Department of Defense, "Reliability and Maintainability Information Required in Requirements Documents and

A very interesting situation arose as the research for this paper was being accomplished. In one office of the Department of Defense this writer read a letter from a United States Senator who requested, from the Secretary of one of the services, information pertaining to the total number of dollars spent each year in each of the fifty states. Should this request be challenged or does it pertain to Congressional investigation? The point is, this took the employee in the Department of Defense away from his primary job for "high priority" information.

Additional responsibility is being requested of contractors today to evaluate their proposed project which is being purchased by the Department of Defense and to furnish some objectives their project will meet. If these requests become a Department of Defense instruction, the maintainability of aircraft should increase the combat readiness and effectiveness.[47]

Through the use of "WRAP" and additional management engineering tools the increased technological advancements will be compensated through the use of the WR-30 program.[48]

Through information gained from the Fleet Work Study group and other programs in process, the individuals working on the airplanes are given a chance at something they have not

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Technical Development Plans," Instruction 3200.6 (Inclosure 2) June 7, 1962, pp. 1-3.

[47]U.S., Department of the Navy, Bureau of Naval Weapons, Weapons Requirements, Weapons Readiness, Achievement Program, WR-30 Program, June 12, 1962, pp. 14-15.

[48]Lt. Col. Richard A. Bauer, USMC "'WRAP' Unwrapped," Naval Aviation News, April, 1962, pp. 32-35.

had for the last twenty years--a chance to learn entire aircraft systems. They are working on a "team" which is to accomplish the many-sided tasks efficiently and as quickly as possible.

Cost Versus Effectiveness

The modern world which we live in today makes it dificult to predict how effective the defense of our country is in terms of money expended. With a peacetime defense budget in excess of fifty billion dollars, many people wonder why it takes so much money to protect our country.[49] The public also wonders and questions why we need a peacetime personnel strength of over two and one-half million personnel. Although the Marine Corps is a minority portion of the total strength, it still accounts for over 188,000 personnel.[50]

The typical Marine fighter squadron will account for approximately 220 personnel of which 30 of these will be officers. This is a very small number compared to the overall strength, yet they are responsible for some of the most expensive equipment in the Marine Corps. The majority of this equipment is also the most expensive to run.

Examination of Exhibit 5 shows the average cost per flying hour for selected aircraft types. As an example, one may assume that each F8U-2N fighter squadron must fly approximately 720 hours per month to become combat ready and complete its

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[49]U.S., Department of the Navy, Office of Comptroller, Navy Budget Digest, Fiscal Year 1963, NAVEXOS P-1355, p. 36.

[50]U.S., Department of Defense, Office of the Secretary, Directorate for Statistical Services, Selected Manpower Statistics, January 1, 1963, p. 5.

EXHIBIT 5

AVERAGE COST PER FLYING HOUR FOR SELECTED AIRCRAFT TYPE, FY 1962[a]

(In dollars)[b]

Fighter	
F8U-2N	$ 500[c]
Attack	
A4D-5	440[c]
Transport	
GV-1	1,130[c]

[a]Source: U.S., Cost Estimates, op. cit.

[b]All figures approximate for confidential purposes.

[c]Less personnel costs.

phase training. This means that it costs approximately $360,000 for one month's training. It can be assumed that no squadron can become completely trained in one month's time and be effectively combat ready.

When one compares the costs of Exhibits 3 and 4 with the costs of Exhibits 5, 6, 7, and 8, it may be seen that there must be effective leadership and some form of work simplification if there is to be any "profit." As an example, an F8U-2N squadron with twenty aircraft and twenty aviators, plus 220 enlisted men consumes many thousands of dollars in one month. Exhibit 6 shows that this one squadron is one in a group which would probably have three other squadrons. Comparing Exhibit 5 and a group having two fighter squadrons with Exhibit 6 and the maintenance and operating costs of a similar size group, one may make the assumption that there must be effective leadership and coordination for the amount of money invested in fixed assets. Next, in a comparison of Exhibit 7 with Exhibit 6, one can make the assumption that there is considerable upkeep to the fixed assets and today it requires more than one person to maintain the complicated, complex pieces of machinery. The manner in which the commanding officer of a tactical squadron trains his squadron is not set by rigid rules to the effect that he can spend only a certain amount of money in any certain day. He is alloted money quarterly and the training he gets from the alloted money is directly proportional to the leadership and the morale of the squadron. High morale creates high productivity and satisfaction. This, in turn, could be related to the

EHBIBIT 6

INITIAL INVESTMENT COST OF MARINE AIRCRAFT WING, FY 1962[a]

(In thousands of dollars)[b]

Marine Aircraft Wing (Total	$220,840
Marine Wing Hq. Group	
1 Training Squadron	7,350
Marine Wing Service Group	
1 Inflight Refuel Squadron	37,000
1 Composite Photo Squadron	11,850
Marine Air Group	
2 Fighter Squadron	33,950
2 Attack Squadron	19,800
Marine Air Group	
2 Fighter Squadron (All Weather)	29,600
2 Fighter Squadron	18,600
2 Attack Squadron	17,000
Marine Air Group	
4 Helicopter Trans. Squad. (Light)	28,640
1 Helicopter Trans. Squad. (Medium)	12,650
1 Observation Squadron	4,240

[a]Source: U.S., Cost Estimates, op. cit.

[b]All figures approximate for confidential purposes.

EXHIBIT 7

ESTIMATED ANNUAL MAINTENANCE AND OPERATING COSTS FOR MARINE AIR WING, FY 1962[a]
(In thousands of dollars)[b]

	TOTAL	PERSONNEL	ALL OTHER	AIRCRAFT OPERATIONS	AIRFRAME OVERHAUL	ENGINE OVERHAUL	APA	ALL OTHER
Marine Air Wing (Total)	$69,950	$18,780	$51,175	$8,900	$5,600	$1,480	$3,500	$4,600
Marine Wing Hq. Group								
1 Training Squadron	2,700	850	1,850	510	210	25	960	155
Marine Wing Serv. Group								
1 Inflight Refuel Sq.	12,050	1,400	10,650	2,120	420	190	7,550	390
1 Comp. Photo. Sq.	3,350	1,025	2,550	565	320	80	1,330	260
Marine Air Group								
2 Fighter Squadron	8,970	2,280	6,680	1,155	690	250	3,950	600
2 Attack Squadron	6,700	1,850	4,825	860	500	140	2,880	425
Marine Air Group								
2 Fighter Squadron (All Weather)	8,170	2,280	5,885	1,310	625	250	3,050	575
1 Fighter Squadron	4,500	1,140	3,365	575	345	145	1,970	310
2 Attack Squadron	6,925	2,000	4,925	950	655	170	2,600	540
Marine Air Group								
4 Helicopter Transport Squadrons (Light)	9,675	4,000	5,675	570	1,215	125	2,885	875
1 Helicopter Transport Squadron (Medium)	4,525	1,025	3,500	230	445	50	2,445	325
1 Observation Squadron	2,025	895	1,130	35	130	25	825	100

[a]Source: U.S., Cost Estimates op. cit.

[b]All figures approximate for confidential purposes.

EXHIBIT 8

AVERAGE PAY RATES FOR NAVY AND MARINE CORPS PERSONNEL, FY 1962[a]

(In dollars)

	NAVY	MARINE CORPS
Officer	$7,519.52	$7,031.38
Enlisted	2,971.48	2,578.71
Officer and Enlisted	3,481.35	2,995.40

Note : The above rates include basic pay, basic allowance for subsistence and quarters, subsistence in kind and clothing, and uniform maintenance allowance for enlisted personnel.

	NAVY		MARINE CORPS	
	OFFICER	ENLISTED	OFFICER	ENLISTED
Aviation Pay	$2,346.04	$927.29	$2,236.50	$903.31
Submarine Duty Pay	2,172.29	924.79	---	---
Special Pay (Sea and Foreign Duty Pay)	---	150.91	---	127.48

[a]Source: U.S., Cost Estimates, op. cit.

different management tools utilized to accomplish the ultimate objective. One of the most effective is work simplification.

Control and Responsibility

Control of effective programs is only as good as the director or coordinator. Although there may be an excellent inspection team or a good quality control section, that is no reason that their work cannot be simplified. Perhaps the quality control people wait until the job or operation is complete before inspecting it for discrepancies. Why could they not have inspected the aircraft prior to "buttoning up"? This would save man-hours if they found discrepancies and the aircraft had to be "unbuttoned."

The control function needs a specific guideline. A complete job description and functional guide needs to be available at all times to remind personnel of their specific function and "responsibilities" to the organization as a whole.

The responsibility is in every person's hands. They must work as a team to eliminate unnecessary movements or operations which are not productive. Above all, it is a command function to analyze operations at all times with an alert "eye" on the individuals performing the functions. A suggestion could save a person time and money.

A commanding officer is responsible for a squadron of men, aircraft, and related material, and can only measure his profits by high morale, good combat readiness and an effective squadron. The monetary profits are not visible, but what he does or gets for the money expended is available for analyzation

by higher authorities. Therefore, the decentralized authority that is practiced can be the prime profit maker. The lowest level of the command who realizes that the better he accomplishes his job in the least amount of time, through use of work simplification, will be the asset which affects the liabilities in a squadron created by the constant anticipation of deployment.

Controlled management means the kind of management in which all actions are based on judgment guided by facts which have been intelligently interpreted and simply presented. Aircraft operations today is a good illustration of this technique. After each test flight, the pilot, line maintenance chief and check crew leader, quality control coordinator, and factory representatives can get together and go over the Pilots Flight Check Sheet. On the basis of information gained through this consultation, the personnel involved are able to work off the discrepancies and prepare the aircraft for subsequent flights. In addition, in some instances, the pilot may have radio contact with these personnel during the flights to report further flight data. Contrast this with the old days when the pilot got out of his plane and left, telling perhaps only the mechanic of any discrepancies he had noticed.

With the extremely complicated piece of machinery that is hurled around the skies today at supersonic speeds it is imperative that these consultations take place so that others may gain firsthand experience. This creates better utilization and availability.

CHAPTER VII

CONCLUSIONS

Although there are inferences of personal feelings throughout this paper, let a few points be re-emphasized in particular.

Work simplification is all around us every day of our lives. It is here to stay and it must be accepted as beneficial and not detrimental from the standpoint of changing our everyday routines. Since God has made only One perfect person we must utilize every available resource to the best of our ability. How this is accomplished will vary from operation to operation and from person to person.

The challenge of work simplification is ever increasing. Technological developments and automation needs are going to increase the requirements for work simplification even further. How much the work is simplified before it is automated will ultimately lead to greater effectiveness and profit.

The advent of more nonrepetitive work in all organizations and activities, and higher labor costs, are reasons why more work simplification is needed. In industry the larger companies can install automatic data processing to produce greater profits. Conversely, the small companies, which cannot

afford automatic data processing, are not as complex and must rely on work simplification for a profit margin.

Why not analyze ourselves, both at home and at work? Do we not really waste time? A negative answer would be rebutted with exceptions from many people. As Americans, we have it pretty "soft." Basically, we are all lazy. No longer do all children walk to school or ride their bicycles to the playground. Today they either drive their own car, travel by bus, or are driven by their parents. This, of course, could be the use of work simplification since the car was an invention that contributed to the aspects of work simplification. But the basic idea that we are lazy will lead to wasted resources if we do not practice work simplification.

The housewife is another example of work simplification. She cannot be blamed for the methods of accomplishing her work. The design of houses is one of the prime targets which every prospective homeowner should analyze prior to the purchase of a house. Architects design houses for beauty and not necessarily for work simplification. Look at the design of the kitchen. Could it not have been designed to save the housewife many steps and ultimately make housekeeping easier? This is just one example around the house, and many more can be found. Should the architect be asked "why?", he will probably come back with the answer, "Because houses have always been built this way." This is one area in which some action needs to be taken. This can be accomplished only through the use of the related management engineering tools such as design, methods and others.

But, ultimately, the work that the housewife performs would be easier and simpler.

In the military, why must there be reports for reports for reports? Although there is a so-called reports control division, this job could be simplified through the elimination of the repetitive reports that are useless. Why are there so many reports? It is for the people who have the philosophy of "just in case." This is wasted manhours and money.

There is currently being published an excellent document by the Navy Department: "The Dillon report." What the outcome of the Dillon report will be cannot be predicted at this time, but an assumption can be made that there will be more effective use of manpower in the future. How this will be accomplished will probably be the individual commander's responsibility. How will the commander get an increased output from the available resources? My opinion is through work simplification and other related management tools. Operations analysis will come into prominence more in the future, and a finding of how the work is apportioned and who is responsible will be an important step in the right direction. Will the authority be more centralized or decentralized? If there is effective management with practicing work simplification there can be decentralized authority, thereby creating more time available at higher echelons for critical management decisions. The amount of time used by top management to solve problems at the lowest level in an organization is basically wasted. If correct guidelines had been set

in the first place there would be no need for top management to solve the problems of the lower levels.

The Secretary of Defense, Mr. Robert S. McNamara, is, in my opinion, a great practitioner of work simplification. Through his efforts and the efforts of the related service departments he has told the contractors, for example, that they must build projects as cheaply as possible. How, then, are the contractors going to make profits? They will have to utilize every available management engineering tool and especially work simplification. It has been expressed by many contractors that they cannot make profits from the government projects. This I doubt. Mr. McNamara wants the most from his men, money, and materials. His background is sufficient to comprehend the knowledge communicated to him by his staff of specialists and he, in turn, knows how to communicate to the different companies contracting for the national security projects. Mr. McNamara understands lead time, production costs, material resources, and the other elements so vital to production. How the managements of these different contracting companies react to some of his decisions will undoubtedly reflect their present management practices.

Although the comparison of industrial use of work simplification and how it is used in the military is hard to correlate we must take those applications used in industry and, where applicable, apply them in the military. The use of common sense should point out areas where they are applicable to every

individual. Why not use this common sense to make your work easier and more productive?

In the present state of the art of high production costs, high manpower costs, and limited resources we must have effective control and management. What could be a better goal than working smarter, not harder?

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